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Operating Instructions

ecom® • J2KN •

Model Industrie ß

Index

	Page
Important hints	3
1. Instrument design	
1.1. Basic module	4
1.2. Control module	5
1.3. Accessories	6
2. Gas cooler (option) / Version ecom-J2KN-P	7
3. Power supply	8
4. Radio communication basic/control module	9
5. Data record	10
6. Instrument switch on	11
7. Input or selection of combustion plants	13
8. Flue gas analysis	
8.1. Gas analysis	16
8.2. CO mesurement (gas path check)	19
8.3. O2 check	20
8.4. Flow measurement (Option)	20
8.5. Draught measurement	21
8.6. Soot dot...Oil trace	22
8.7. Measurement record and printout	24
8.8. Printout ecom-J2KN	25
9. Mean Value Measurement (Option)	26
10. Adjustments	28
11. Control	31
12. Data processing	
12.1 Communication	32
12.2. Automatic Measurement	33
12.3. Data logger	34
13. Diagnostics	
13.1. Fault diagnostic	35
13.2. dT-measrurement	37
13.3. Heating check (Option)	37
14. Maintenance tips	41
15. Technical data	44

Important hints

The ecom-J2KN meets the requirements of DIN EN 50379 part of 2.

The ecom-J2KN may not be used for continuous emission control!

Following minimum times must be kept, in order to receive correct measured values:
-1 min. to calibrate the sensors at fresh air
-2 min. for stable measured values

Please start every 15 min. a fresh air calibration by using the infrared bench (especially with methane) to get accurate measurements!

The following substances impair the working of the instrument:

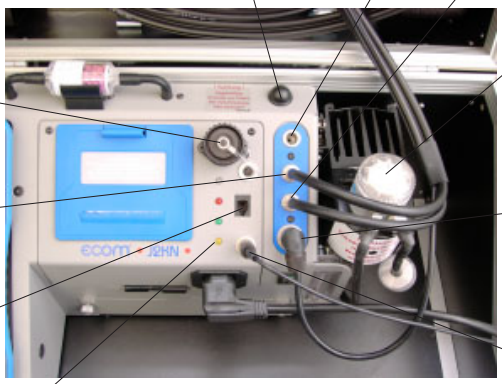
- **-Cleaning agents**
- **-Degreasers**
- **-Wax polishes**
- **-Adhesives**
- **-Formaldehyde**

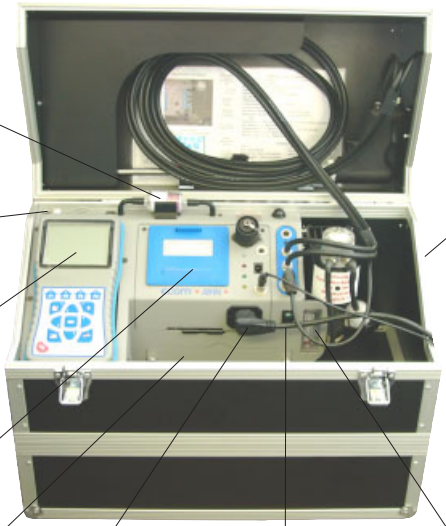
Adjustments at burners and boilers should be made only by specialists, who are familiar with those installations!

1. **Charge the accumulator regularly (Charge not used instrument min. once a month)!**
2. **Never store the instrument with unloaded accumulator!**

1. Instrument design

1.1. Basic module


Antenna radio communication
Connection pressure
Connection gas hose
Connection heated sampling system
Peltier cooler with fine dust filter
Connection draught
Connection gas tempe-rature
Cable socket by wire transfer basic / control modules
Connection air temperature
Control LED´s (see chapter 11.)



1.2. Control module

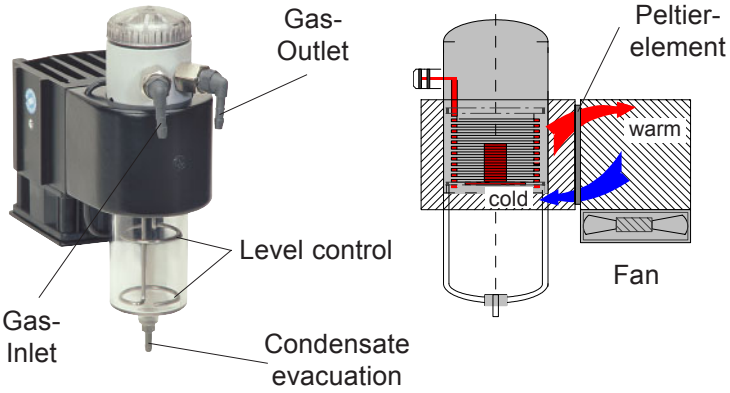
Keyboard control module

In the input mode, the keys are used for numerical inputs.

1.3. Accessories

Add. keyboard Item nr.: 1050011 	**T-room stick** Artikelnr.: 51446
Multi-Media-Card 128 MB Item nr.: 53656 	**Data interface DAS software** Item nr.: 1050060
Data interface giant display Item nr.: 1040030 	**Data cable USB** Item nr.: 55818 *without illustration*
NOx hose 3,5 m (soot probe) Item nr.: 10176 	**NOx hose 3,5 m (probe without soot measurement)** Item nr.: 10178
Filtering plate (solid combustibles) Item nr.:: 50000024 	**Filtering case (solid combustibles)** Item nr.: 55810
Cable control - basic module 1.5 m long, item nr.: 1040021 3.0 m long, item nr.: 1040022 5.0 m long, item nr.: 1040023 10.0 m long, item nr.: 1040024 20.0 m long, item nr.: 1040025 *without illustration*	

2. Gas cooler (option) / Version ecom-J2KN-P



Due to the power supply need of the gas cooler, it is only available with mains power!

Exhaust gas with a temperature over the steam dew point (35 to 65 °C) is flown spiral via a long gas path thru a surface coated metal body with good thermal conductivity. The gas radiates its heat to this metal body. A PELTIER element (semiconductor cooling element) flown by a continuous current is thermically connected with this body and with a second metal body with cooling ribs and ventilation slots. The flow thru the PELTIER element creates a heat transfer from WARM to COLD, drains the heat of the metal body flown by gas and conveys it to the outer cooling body. This heat is conveyed thru a vertical forced ventilation to the surrounding air.

The condensation issued by the heat loss of the gas drops in a receptacle and is pumped out on request (either by the user or due to the level monitoring) by a periodically working hose pump.

The sucking capacity of the gas conveying pump avoids a sufficient dwell time of the gas with the condensate, so that wash out reactions (NO_2+H_2O > H_2NO_3) do not take place.

At the cooler outlet the gas has a temperature of ca. 5 °C with a relative saturation of nearly 100 % relative humidity (corresponds to a water vapour content < 7 g/m^3).

3. Power supply

Used accumulators can be returned to us or brought to recycling stations of public waste disposal companies respectively accumulators selling stores!

The basic module of the ecom-J2KN is delivered with internal loading unit. The instrument can be operated upon a longer time period with the internal accumulator (6 V; 7,2 Ah). Connecting the internal charging unit to mains power is only compulsory to recharge the accumulators and to operate the Peltier cooler and the heated pistol grip probe.

The accumulators should be recharged when the instrument shows a corresponding message (acoustical warning and display information). The accumulators loading stand can be checked, looking at the voltage information on the display (menu "**Control**"). The accu warning is activated when the value „ACC.B“ is smaller than 6 V.
By 5,8 V the power operation via accus is no more possible. The instrument must be further powered via internal charging unit.

Never use batteries to operate the control module of the ecom-J2KN!

The control module of the ecom-J2KN is powered by 3 nickel-metal-hydride accumulators (type AA). In case of need, the accumulators can be recharged by docking the control module to the basic module. Hereby 2 functions can be selected (**„Adjustments / „Internal“ / „Reloading function“ / <OK>**):

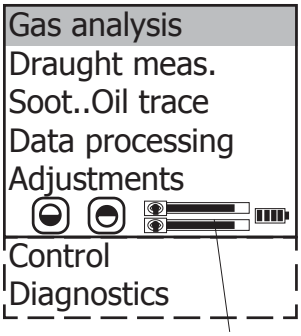
1. **Recharging function ON (<F1> = YES):**
   - accus slowly and carefully recharged
   - recommended adjustment by frequent use
2. **Recharging function OFF (<F4> = NO):**
   - accus quickly recharged
   - recommended adjustment by occasional use

4. Radio communication basic / control module

Thanks to the detachable control module the basic module can be monitored wireless. The basic module can be unlocked as follows:

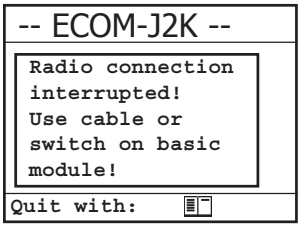
1. Press to unlock.
2. Tip control module forwards
3. Release control module from basic module

The information exchange between control and basic module is performed via radio transmission (868 MHz) with a coverage of approx. 50 m (by free sight). The quality of the radio transmission is documented by a bar indication in the main menu of the instrument (long bar = good radio communication).

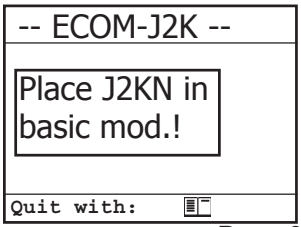


Bar indication radio quality

By interruption of the radio communication, an error message is displayed. By persisting disturbances of the radio communication, a cable (option) can take over the transfer (connection betwen socket DATA on control unit and socket DATA on basic module).



If the basic module is switched off and the control module not, so the display will show an error message inviting to fix the control module in its docking station (helps also not to forget the control module). Observe this order, quit with **<ESC>** and finally switch off the control module.



5. Data record

The multi media card enables the storage of both punctual measurements and data logger records.
The values of punctual measurements are written in a text file (J2KDV.txt). Those of data logger records in a csv file (J2KDL-xx.csv / xx = records numbered consecutively).
Both file types have the same structure and can be imported respectively opened in Excel. See chapter „Technical Data“ for data format information. The files can be transferred on the PC using a card reader. The following conditions must be fulfilled for using a multi media card:

- ecom-J2KN
- minimal card volume 32 MB - max. 2 GB
- card formatted on 16 bit FAT
- SD cards or MM cards from rbr
- PC with card reader from rbr
  - or from the manufacturers Belkin and SanDisk

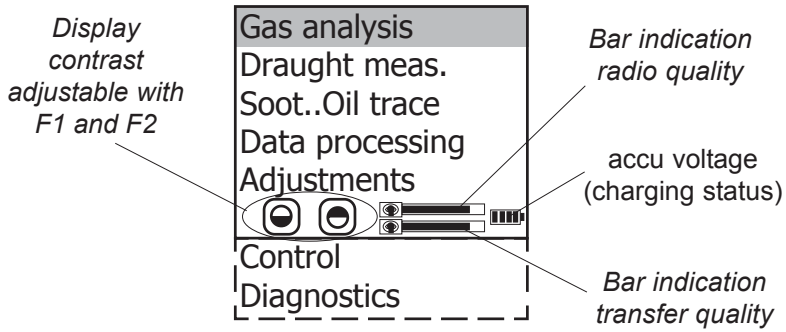
Insert the multi media card as shown. Take care that the card does not stand out and hooks on.

Never pull out cards during data record - data loss and damaging of the data carrier possible!

6. Instrument switch on

Always position the probe in the exhaust pipe once the calibration phase is over!

Always use a filtering system as per our recommendation for combustion plants firing solid combustibles!

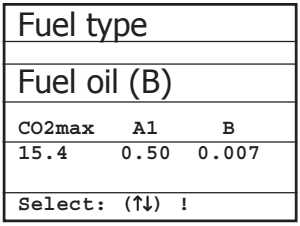


Once the control module has been switched on (key **<I/0>**), the main menu is displayed.
6 sub-menus with the following functions are displayed (non-visible sub-menus can be called up scrolling the arrow keys):

- Gas analysis : Perform gas analysis
- Draught measure. : Perform draught or pressure measurement
- Soot...Oil trace : Input of soot measurements results
- Data processing : Assign measurements / Load or send data
- Adjustments : Modify instrument adjustments
- Control : Check operation state of instrument
- Diagnosis : Read-out of firing automats (only in connection with ecom-AK) / dT-measurement

- To perform concrete measurements, first switch on the basic module (switch located under the condensation trap).
- Use the arrow keys to select the sub-menu **"Gas analysis"**.
- Confirm with **<OK>**. The instrument starts a 1-minute calibration phase and the fuel types selection is displayed.

The following fuel types are available*:

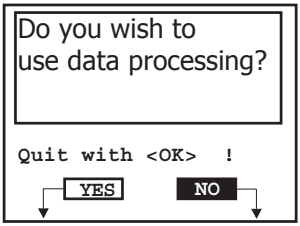


Fuel types acc. to 1.BImSchV

Fuel oil (B)
Natural gas (B)
City gas (B)
Coke oven gas (B)
Liquid gas (B)

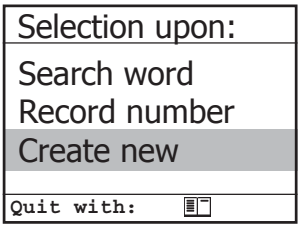
- Use the arrow keys to select the desired fuel type.
- Confirm with **<OK>**.

The instrument will then enquire if you wish to use the data bank. If you want to assign the sampled data to a specific plant, so press **<F1>** (**<F4>** = no -> the measurement will be performed without assignment).



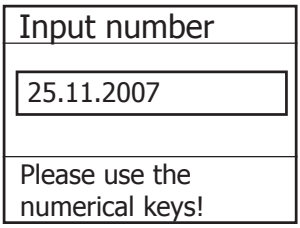
** Country specific fuel types programmable on demand.*

7. Input or select plant specific data



To call up plant data recorded in the J2KN or to create a new file, the following possibilities are available:

Create new: To create a new file, a numerical number can be assigned.



-Select **„Create new“**
-Confirm with **<OK>**.
-Input a number (max. 16 numbers):

Example: "25.11.2007"

-Press **<OK>** after input in order to call up the record number.
-Press **<F3>** to determinate the next free record number (calculated from record number 1).
-Press **<F4>** to input a plant-related code.

Tip: We suggest a date-related input to easily find the data record later on via the search function (search per date).

After confirming with **<OK>** it is possible to enter a text (max. 6 lines with 20 indications) with a software keyboard (for print out or data processing). Proceed as follows:
-choose Text line 1 with the cursor keys **<up/down>** and confirm with **<OK>**
-select keyboard (5 keyboards are available) with **<F3>**
-select with the cursor keys **<up/down/right/left>** a character (selected character is black deposited)
-choose the character with **<OK>** (the last character can be deleted by pressing **<F2>**)
-repeat procedure, until line is complete
-if you want to correct a character, proceeded as follows:
  -interrupt choosing characters with **<F4>**
  -select character with the cursor keys **<right/left>**
  -activate choosing characters with **<F4>** and set a new character
-select the next line after pressing **<F2>**

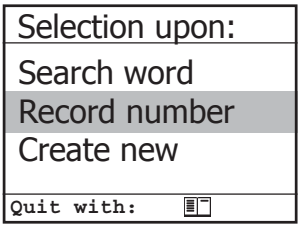
You can close the text input with **<ESC>**. Activate the next free record number with **<OK>** and start flue gas measurement.

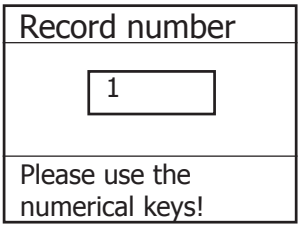
Record number: To create a new file, a record number can be assigned.

- Select **„Record number“**
- Confirm with **<OK>**.
- Input a random record number:

Example: "1" for record number 1

-Press **<OK>** after input in order to call up the record number.
-Press **<F3>** to determinate the next free record number (calculated from record number 1).
-Press **<F4>** to input a plant-related code.

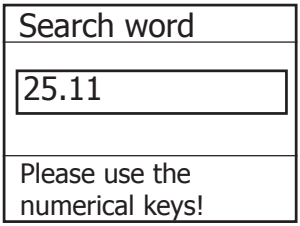


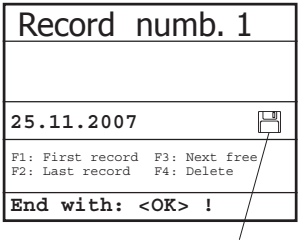


Search word: If the plant code is known, it is possible to find the plant data stored with help of a search machine.

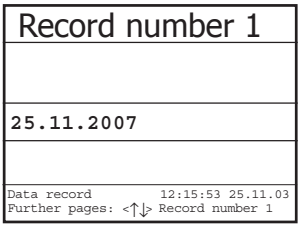
-Select **"Search word"** and press **<OK>**.
-Input 4 related figures of the plant code:
Example: "25.11"
for plant code 25.11.2007
-Press **<OK>** after input to start the searching process. All possible correspondences with this figures sequence will be filtered. The selection can be stepped thru with the arrow keys (F1 for selection beginning, F2 for selection end)
-Press **<OK>** to activate once the desired data block is found
-Press **<Print> / „View memory“ / <OK>** to view the previous analysis at this plant

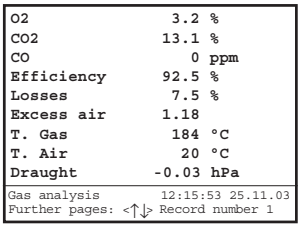
All measured and calculated values can be called up on 4 display pages using the arrow keys to step thru.

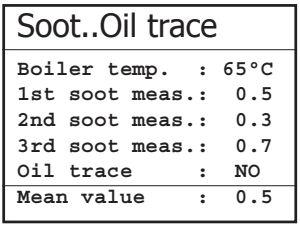


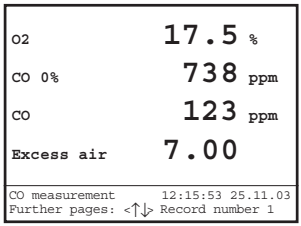


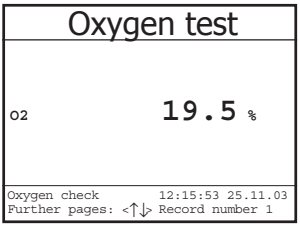
Measurement available











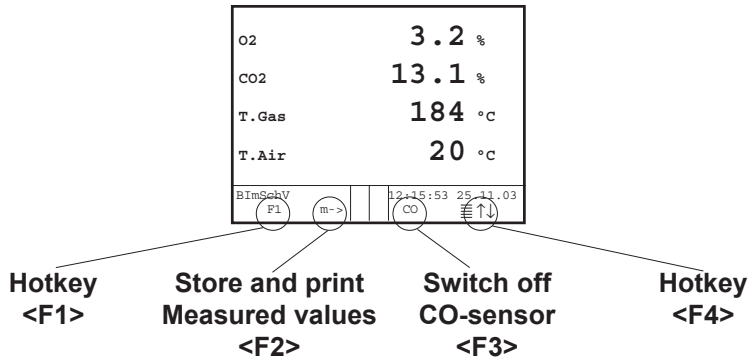
- Press twice **<ESC>** to quit the previous measurement.
The recording of the current measurement values can begin.

8. Gas measurement

8.1. Gas analysis

Re-calibrate the instrument after each measurement (after one hour at the latest) to get correct results!

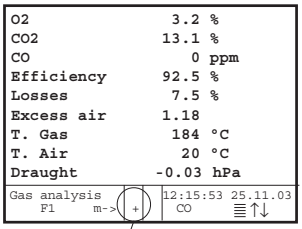
After the 1-minute calibration phase, the instrument switches over to the measurement mode. The gas measurement values can be viewed on 4 display pages (2 x gas analysis; 1 x CO measurement; 1 x oxygen check). Use the cursor keys to scroll the pages.



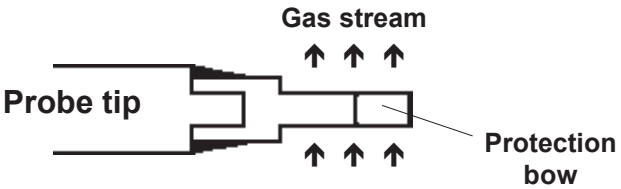
With **<F1>** you can switch from the measured value display to a menu or to „Standby“ selected before (see chapter attitudes). Possible menu options are: Soot... Oil trace, Data processing, Adjustments, Control, Fuel type, Eff. (C), Memory -> M, Pressure. Further you can switch with **<F1>** from any menu back to the measured value display.
With **<F2>** you can print and store the measured values into the intermediate memory at the same time.
With **<F3>** you can switched off the CO sensor, in order to protect the sensor against to high concentrations. The automatic disconnection will switch off the CO sensor at approx. 4000 ppm.
With **<F4>** you can switch from the measured value display to a menu or to „Standby“ selected before (see chapter attitudes). Possible menu options are: Soot... Oil trace, Data processing, Adjustments, Control, Fuel type, Eff. (C), Memory -> M, Display values, Pressure. Further you can switch with **<F1>** from any menu back to the measured value display.

The position of the measured and calculated values (gas analysis) on the display pages is free selectable (choose **„Display values“** for **<F4>** Hotkey). For alteration of the exisiting succession respectively personal listing, proceed as follows:

-Press **<F4>** to activate the function.
  -select the line with the cursor keys (up/down),
  -select the measured or calculated value with the cursor keys (right/left),
  -repeat this procedure until all modifications are completed.
-Press **<F4>** to deactivate the function.



Position the sampling probe in the exhaust channel so that the thermocouple is fully surrounded with the gas (see picture).



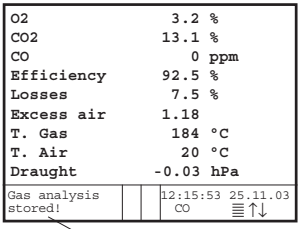
Perform the measurement in the core stream of the exhaust gas channel (probe placed in the highest gas temperature area). A trend indication for T. Gas easies the core stream search. As long as the display shows a + symbol, the measured temperature increases, it means the probe tip moves towards the core stream. If a - symbol is displayed, pull the probe out of the core stream and the temperature sinks. If no temperature change is shown for at least 3 seconds, so the trend indication will be deleted.

CO_2, efficiency, losses, excess air and dew point are calculated values. They can only be calculated if realistic values for the basic parameters O_2 and temperatures are available. It must be ascertained that:

O_2 < 20,5 % and **T.Gas - T.Air > + 5 °C**

are given. The dew point can only be calculated accurately if, in the menu **"Adjustments"**, the current barometric air pressure value has been inputed. This value cannot be determined by the ecom-J2KN. If the gas temperature falls below the dewpoint (between 25 and 65 °C), ETA will be calculated with condensation. In the display (C) appears behind ETA.
Correct measurement values are displayed first after a short delay, necessary for the gas transport and the build-up of a stable electrochemical reaction at the sensors. This time period lasts approx. between 1 and 1.5 minute. For recording, printout and evaluation wait until the values do not change anymore. If deviations higher than 2 ppm still occur by the gas values, they can be due to unstable pressure conditions in the exhaust channel.

If the measurement values are stable and the results can be printed out, press the key **<Record>** (disc symbol) to transfer the values in the intermediate memory (caution: store gas analysis and CO measurement values separately). The values are stored for a later printout and, if need be, for a final data record storage.



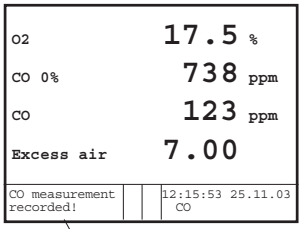
Measurement stored in intermediate memory

If a printout of the values should be made simultaneously to the intermediate recording, so press **<F2>** (the complete content of the intermediate memory will be printed).

8.2. CO measurement (gas channel check)

For the technical check of gas-fired plants in regards of safety aspects the gas channel check called also CO measurement is used. Hereby the CO concentration in the gas channel is measured after the flow safety device and calculated on an undiluted value (oxygen rest content in flue gas = 0 %).
As the gas conditions after the flow safety device are no more homegeneous because of the flow in of secundary air and consequently the core stream measurement can be erratic, the analysis of the exhaust gas is performed along the totality of the exhaust pipe diameter. A multi-hole probe (optional accessory) is hereby used as sampling probe. The calculated value shown on the line CO 0 % corresponds to the measured CO concentration supposed the oxygen content would amount 0% by the same exhaust gas volume.

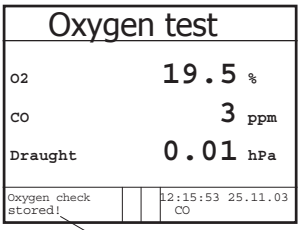
It is consequently the undiluted CO content in exhaust gas. If the value indication is stable, press the key **<Memory>** (disk symbol) to store the result in the intermediate memory. If a printout of the values should occur simulateneously to the recording in the intermediate memory, press **<F2>** (the complete content of the intermediate memory will be printed out).



Measurement stored in intermediate memory

8.3. Oxygen check

This measurement is performed by room-independant plants like gross calorific value plants. It is determined if exhaust gas flows into the combustion air (O_2 content drops down / CO content may be rise) and herewith influence on the combustion quality.
For this analysis a special multi-hole probe (optional accessory) should be used. If the value indicated is stable, press the key **<Memory>** (disk symbol) to store the value in the intermediate memory. If a printout of the values should occur simulateneously to the recording in the intermediate memory, press **<F2>** (the complete content of the intermediate memory will be printed out).

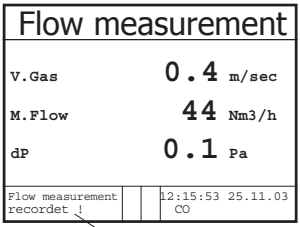


Measurement stored in intermediate memory

8.4. Flow measurement (Option)

This measurement can be done with a pitot tube. At first the pitot factor of the pitot tube must be entered (**„Adjustments“** / **„Internal“** / **„Pitot factor“**). After connecting the pitot tube to the instrumentment, the zero point of the sensor can be set with **<F4>**. With **<F1>** the cross section of the flow channel can be entered (needed for colculation of the flow rate). After the pitot tube iss positioned in the flow channel, the display shows the speed (m/s), the flow rate (Nm3/h) and the differential pressure (Pa). If the value indicated is stable, press **<Record>** to store the value in the intermediate memory. If a printout of the values should occur simultaneously to the recording in the intermediate memory, press **<F2>** (the complete content of the intermediate memory will be printed out).

Connections for pitot tube

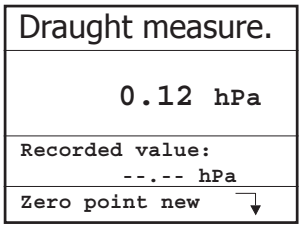


Measurement stored in intermediate memory

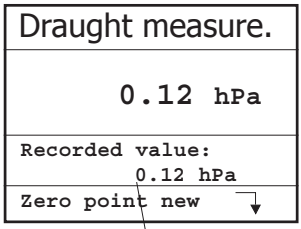
8.5. Draught measurement

A trend indication for the draught conditions in the exhaust channel can already be determined during the gas analysis. Nevertheless the value for the chimney draught will not be stored together with the gas values while pressing the key **<Memory>**.
Indeed the difference pressure sensor tends to drifts because of its sensibility and, for an exact measurement, it is consequently advised to re-calibrate the sensor immediately before sampling and documenting the value.

Access the menu while selecting the sub-menu **"Draught measurement"**. The current value is displayed as well as the instruction to adjust the zero point of the sensor. Release hereto the draught hose from the instrument for a short moment and press **<F4>**. The sensor is herewith re-calibrated.

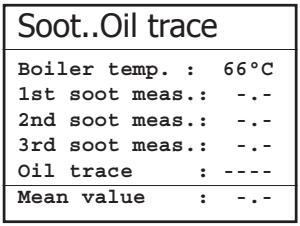


Fix the draught hose again. The display shows the exact measurement value which can be stored while pressing **<Memory>** and added to the previous results in the intermediate memory. The stored value is shown on the display. Press **<ESC>** to quit the differential pressure measurement menu.



Measurement stored in intermediate memory

8.6. Soot...Oil trace



The sub-menu **"Soot...Oil trace"** enables the input of measured results for boiler temperature, soot dots and oil trace. Select the line **„Boiler temp.“** and press **<OK>** to activate the input. The input can be made using the numerical keys. Press **<OK>** to store the value in the data record of the measurement.

The soot dot measurement is to be performed with the optional heated pistol grip probe which heating function prevents the filter paper to become wet because of the humidity issued by the combustion condensate. The filter paper slot is hereby heated up to approx. 70 °C. Switch hereto the probe heating of the pistol grip probe while selecting **„Adjustments / Internal / Probe heating / <F1>“**.

Proceed as follows:

-Switch on the probe heating while selecting **„Adjustments / Probe heating / <F1>“**.
-Insert a filter paper in the paper slot.
-Select the line **„1st. soot dot“**.
-Press **<OK>** to start the measurement. The display shows the volume to be sucked and the pump starts sampling.

If the soot dot analysis are made with a manual pump the sucking procedure can be interrupted while pressing **<F4>** (result value can immediately be entered).

Once 1,63 litre has been sucked in, the instrument will instruct to input the opacity degree. Proceed as follows:

-Release the filter paper from the probe slot.
-Compare the greyness with the opacity scale.
-Input the result using the numerical keys and press **<OK>**.
-Repeat this procedure until all 3 soot dot analysis are completed. The mean value will be calculated and automatically stored.

The result of the oil trace check is to be documented as follows:

-Set the cursor on the line **"Oil trace"**.
-Input the result with **<OK>** (**"NO", "YES"** or **"- - - "**)

Soot...Oil trace	
Boiler temp.:	66°C
1st soot meas.:	1.0
2nd soot meas.:	0.5
3rd soot meas.:	1.5
Oil trace :	NO
Mean value :	1.0

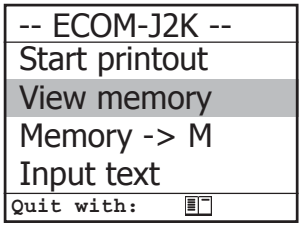
-Press **<ESC>** to quit the menu once all necessitated inputs have been entered. The measurement is now completed.

Get the probe cooled down before putting it back in its fixation!

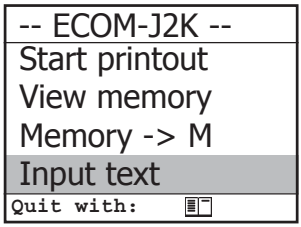
8.7. Measurement record and printout

Important: Once the gas analysis is completed, transfer the values recorded in the intermediate memory into the internal memory otherwise they could get lost by switch-off of the instrument!

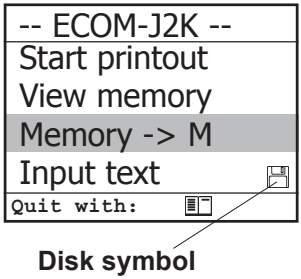
Press **<Print>** (printer symbol) to enter the printing menu. The sampled data can be be checked one more time (**„View memory“**, **<OK>** and scroll with the cursor keys).



The software keyboard enables the input or correction of the 6 x 20-character text. Select hereto **„Input text“**, press **<OK>** and input text (see page 13).

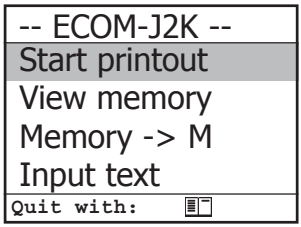


Press **„Memory -> M“** and **<OK>** to store the all data -if correct- in the internal memory or on the multi media card. Once the transfer is completed, a **"Disk symbol"** appears on the bottom right of the display. The inputed text will only be recorded in the data record by use of the multi media card.



Select **„Start printout“** and press **<OK>**) to start a printout.

Press **<ESC>** to turn back to the gas analysis menu.



8.8. Printed protocole ecom-J2KN

Free text input (6 x 20 characters for comments, remarks, information, ...)

For example name

Date and time of recording

Results of CO check

Results of O2 check

Gas analysis results

Results of differential pressure measurement
Results of soot measurement

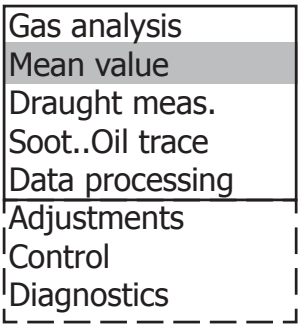
Free text programming of 8 lines 20 characters each for customer´s company address

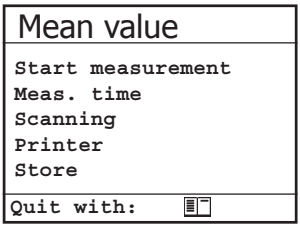
```
**********************
* E C O M - J 2 K N *
**********************
TextTextTextTextText
TextTextTextTextText
TextTextTextTextText
TextTextTextTextText
----------------------
Mister Musterman
----------------------
Date        Time
21.09.04    13:42:02
----------------------
CO measurement
----------------------
O2            19.5  %
CO  0%O2      6370  ppm
CO             455  ppm
Exc. air     14.00
----------------------
O2 value in air
----------------------
O2            19.9  %
----------------------
Gas analysis
----------------------
Fuel type
Fuel oil
----------------------
T.Air           22  °C
T.Gas          122  °C
T.Boiler        66  °C
O2            19.6  %
CO             170  ppm
CO2            1.0  %
Eff.          50.6  %
Losses        49.4  %
Exc. air     15.00
Dew poi.       105  °C
Draught     -0.02  hPa
Soot        1.5 1.0 0.5
Oil trace    NO
----------------------
-rbr- Messtechnik
Am grossen Teich 2
58640 Iserlohn
----------------------
Tel. 02371-945-5
Fax. 02371-40305
EMail : info@rbr.de
http://www.rbr.de
```

9. Mean Value Measurement (Option)

By mean value measurement function measurements can be taken in an adjustable time frame and mean values can be calculated. Should the several measurement values be stored a storage place has to be selected as described in chapter 7. Based on this storage place all measurements will be written consecutively on the next storage place (observe storage capacity).

After run through fresh air calibration the menu point **"Mean value"** can be chosen. Before the mean value measurement can be started the settings for **"Meas.time"**, **"Scanning"**, **"Printer"** and **"Storage"**should be checked and if necessary be changed. The meanings are:





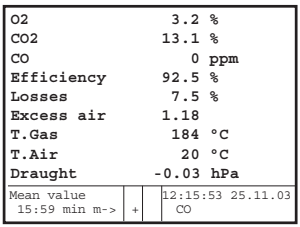
-Meas. time = Time frame in which the mean values will be calculated
-Scanning = time between the measurements taken for mean value calculation
-Printer = logging of measurements taken for mean value calculation
-Store = all measurements for mean value calculations will be stored

"Measurement time" and **"Scanning"** can be adjusted as follows:
-select menu point and confirm with **<OK>**
-with the numeric keys set the desired time:
0.01 = 1 sec. = minimum value
59.59 = 59 min : 59 sec. = maximum value
-confirm with **<OK>**

The setting for **"Printer"** can be changed as follows:
-select menu point and confirm with **<OK>**
-select desired setting with the curser keys
-confirm with **<OK>**

The setting for **“Store”** can be changed as follows:
select menu point and confirm with **<OK>**
activate storage function with <F1>
deactivate storage function with <F4>

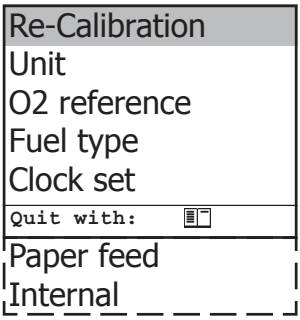
By **‘Start measurement’** / **<OK>** the evaluation of the measurement values will be started. On the display the actual mean values will be shown (will be updated with new measurement values). After finishing the measurement time a protocol of the results with all mean values will be printed.



10. Adjustments

Additionally to the **ecom-J2KN** functions described previously, various adjustments can be made in the instrument.

From the main menu select the sub-menu **"Adjustments"** and confirm with **<OK>**. A selection of modifiable parameters, adjustable according to the application, is displayed.
Place the cursor on the desired line and press **<OK>** to call up or modify the adjustment.
The modifiable parameters are:



Re-Calibration (Start with **<OK>**):
-Start of a calibration phase to set new zero-point for the sensors

Unit (adjustment with **cursor keys**):
-Calculation of gas concentrations in:

-ppm	= volume concentration (parts per million)
-mg/m^3	= mass concentration per volume unit
-mg/kWh (undiluted)	= mass concentration per power unit
-mg/MJ (undiluted)	= mass concentration per power unit
-ppm (undiluted)	= volume concentration (parts per million)
-mg/m^3 (undiluted)	= mass concentration per volume unit

Undiluted:
-Conversion of the gas concentration on selected reference oxygen:

-mg/kWh and mg/MJ are always calculated on 0% O2 basis

-Conversion formula:

$$E_{ref} = E_{meas} * \frac{21 - O_{2ref}}{21 - O_{2meas}}$$

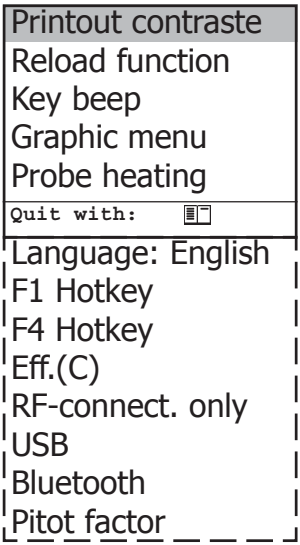
O2 reference
(for ppm and mg/m^3 units - Input after **<OK>** pressing):
- Input of 02 reference value O_{2ref}

Fuel type (press **<OK>** to access selection list):
-Modification of adjusted fuel type (e.g. by measurements at combi-plants)

Clock set (press **<OK>** to access setting menu):
-Correction of internal clock with cursor keys

Paper feed (press **<OK>** to activate paper feeding):
-Paper feed line by line

Internal (press **<OK>** to open menu):
-Further instrument setttings:



Printout contraste (0..9)
(press **<OK>** to access input menu):
-Printer contraste adjustment

Recharging function
(**<F1>** for YES / **<F4>** for NO):
-Careful (**<F1>**) or quick (**<F4>**) recharging of the control module accumulators

Key beep (**<F1>** for YES / **<F4>** for NO):
-Acoustical signal by key pressing

Graphic menü (**<F1>** for YES / **<F4>** for NO):
-Activation of graphic mode

Probe heating (**<F1>** for YES / **<F4>** for NO):
-ON/OFF switch for probe heating for soot measurement (by use of the optional heated pistol grip probe)

Language: English
-Info about language (3 languages selectable)

F1 Hotkey (Choose after pressing **<OK>**):
-Change the menu you get to after pressing **<F1>** in measured value display

F4 Hotkey (Choose after pressing **<OK>**):
-Change the menu you get to after pressing **<F4>** in measured value display

Eff.(C) (**<F1>** for YES / **<F4>** for NO):
-ON/OFF switch for calculation of Efficency with and without condensation

RF-connect. only (Choose after pressing **<OK>**):
-**Standard**: no radio connection if contol module is located in basic module
-**RF-connect. only:** radio connection also if contol module is located in basic module
-**Remote:** without function

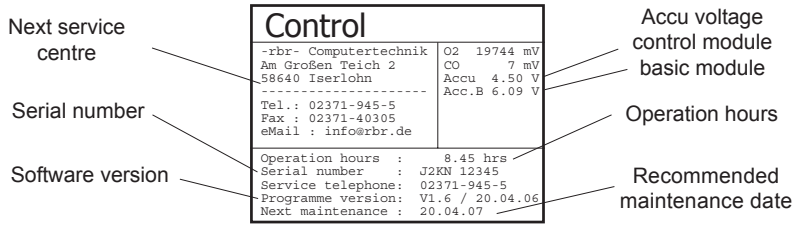
USB (selection after pressing **<Enter>**):
- Adjustment of transfer speed and protocol for the USB interface (connection USB) with the cursor keys

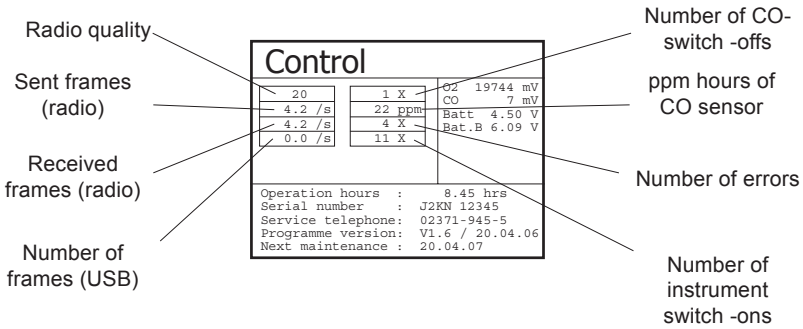
Bluetooth (selection after pressing **<Enter>**):
- Adjustment of protocol for the Bluetooth interface with the cursor keys

Pitot factor (selection after pressing **<OK>**):
-Input of Pitot factor for flow rate calculation (rbr flow probe = 0.93). If the flow rate calculation is not needed, set Pitot factor to 0

11. Control

The electrochemical sensors alter their output values along the operation period. The programme controls the sensors and corrects drifts. If the drifts and the correlated measurement errors increase, an error message is displayed. In this case the corresponding sensor must be changed by an authorised service centre. The control menu informs about the current status values for the sensors as well as about (page 2 with cursor keys **<up/down>**):





Control-LED´s:

LED 1
OFF = accu operation
lights red = accu in recharge
lights green = accu is recharged

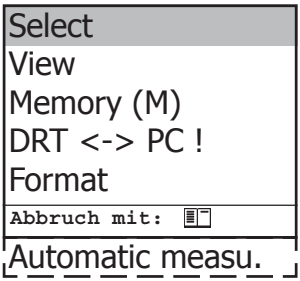
LED 2
OFF = no error
blinks red = error has occurred

LED 3
OFF = basic module OFF
blinks green = basic module is switching off
lights green = basic module is ON

LED 4
OFF = basic module is OFF
blinks yellow = calibration phase in process / purging phase in process
lights yellow = basic module is calibrated

12. Data Processing

12.1. Communication

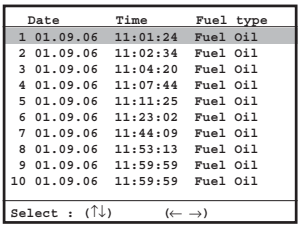


If a MM card is inserted in the slot, so it will be used as record medium. The menu **„Data processing“** offers the following functions:

Select:
For search or creation of plants files for measurement values assignment (compare chapter 7.).

View:
Recorded values to a selected plant can be viewed (compare chapter 7.).

Memory (M):
Here all stored measurements (sortiet by record number) can be seen. Individual measurement values can be called as follows:
-Choose record number with the cursor keys and confirm with <OK>
-Scroll with the cursor keys
-Leave record number with **<ESC>**

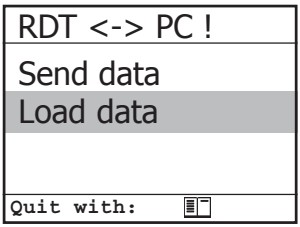


	Date	Time	Fuel type
1	01.09.06	11:01:24	Fuel Oil
2	01.09.06	11:02:34	Fuel Oil
3	01.09.06	11:04:20	Fuel Oil
4	01.09.06	11:07:44	Fuel Oil
5	01.09.06	11:11:25	Fuel Oil
6	01.09.06	11:23:02	Fuel Oil
7	01.09.06	11:44:09	Fuel Oil
8	01.09.06	11:53:13	Fuel Oil
9	01.09.06	11:59:59	Fuel Oil
10	01.09.06	11:59:59	Fuel Oil

Select : (↑↓) (← →)

RDT <-> PC !:

Load data:
Enables the data import from e.g. rbr software (available on our website „www.rbr.de“). See chapter „Technical Data“ for data format information (please observe the transfer options of your software!).



Proceed as follows:
-Connect ecom-J2KN and PC via USB cable.
-Select **"Load data"** and confirm with **<OK>**.
-Answer the displayed question with **YES** (**<F1>**).
-Decide if the data recorded can be cancelled
(**<F1>** for **YES** / **<F4>** for **NO**).
-Start the data transfer on your PC.

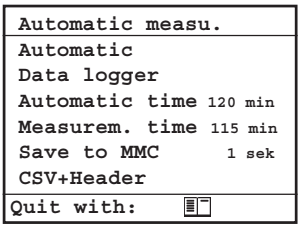
Send data:
With this function the data records completed with measurement values can be transferred to the PC programme (procedure similar to chapter **„Load data"**).

Format:
This function is usually needed by the initial adjustment of the instrument at our factory (preparation of internal memory for data record).
Caution: All stored values will be cancelled!

12.2. Automatic measurement

The configuration of the ecom-J2KN with operation securing, self regulating additional components like the condense trap, the gas cooler and the magnetic valve technique permits even a long term operation of the instrument. By setting time intervals for the measurement the instrument switches autonomously to fresh air purge after the measurement phase (gas will be sucked via the connection fresh air) and operates a calibration phase for the sensors.

This cycle repeats itself until the automatic measurement will be finished. For setting the time intervals select from the menu **"Data processing"** the menu item **"Automatic measu."**. The time intervals have following meanings:



Automatic time (min. 10 minutes / max. 120 minutes)
Time interval from one calibration phase to the next one.

Measurement time (max. Automatic time minus 5 minutes)
Time interval within the automatic time in which the instrument gather measurement values, i.e. in which the measurement gas will be sucked. The difference between the measurement time and the automatic time is used for purging the sensors with fresh air.

Save to MMC (min. 1 second / max. 255 seconds)
Adjustment of the interval time for data logger recordings.

CSV+Header (<F1> for YES / **<F4>** for NO**)**:
Adjustment of data logging with or without column headings.

Start the automatic measurement by setting the cursor to line **"Automatic"** and pressing the key <**OK>** (on top right on the display appears **"A"** for automatic).

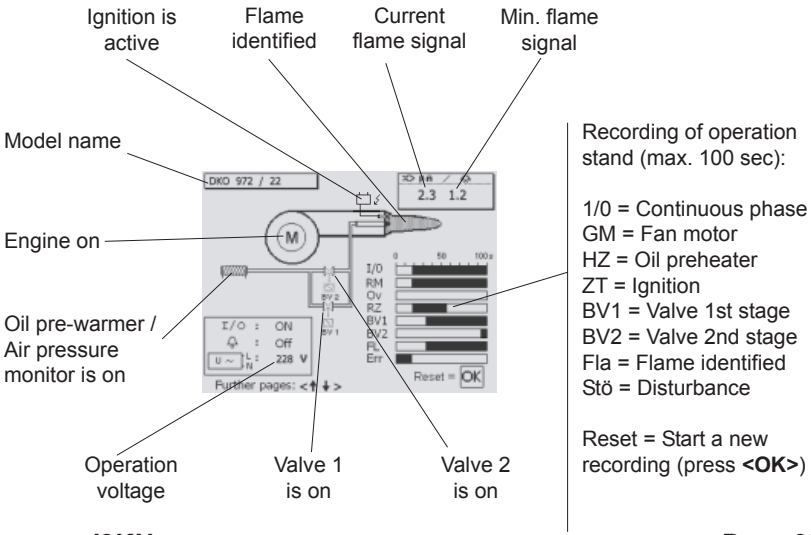
12.3. Data logger

Here a Data logger record (**"Data logger"** and key **<OK>** / on top right on the display appears the disk symbol) can be started or finished (just available when using the multi media card). For each recording one file will be written on the card. The files will be numbered consecutively (J2KDL-00.csv, J2KDL-01.csv and so on) and can be transferred to PC with a card reader. The length of a dataset is 500 byte which means that on a 32 MB card 64000 measurements could be recorded.
In addition to data logger recordings the data could be transferred online with USB (**USB Driver** / **1200 Baud** / Protocol **DAS**), Bluetooth (Protocol **DAS**) or data interface to the software **"DASNT"**. The software **"DASNT"** and the **USB Driver** are available free of charge from the rbr website.

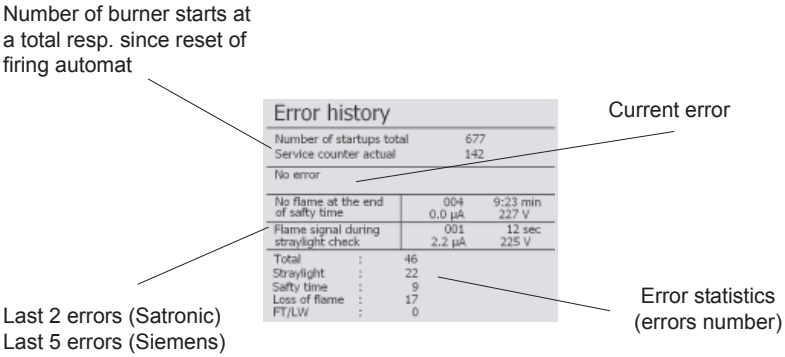
13. Diagnostics

13.1. Fault diagnostic

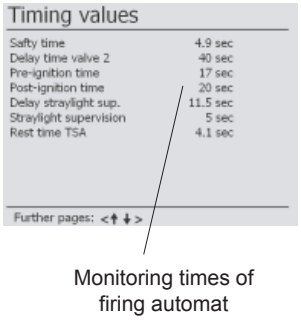
The ecom-J2KN is able to receive and to process information sent via radio by the ecom-AK (read-out head for digital firing automats). The distance between ecom-J2KN and ecom-AK should hereby amount 5 m at a maximum (free sight).
In the main menu select the sub-menu **"Fault diagnosis"** and confirm with **<OK>**. The ecom-J2KN tries to get into contact with the ecom-AK (message: „Searching“) Once the connection is realized, the current operation stand of the burner is shown graphically on the display. The operation stand can be recorded (max. 100 sec).
Press **<OK>** to start a new recording phase (reset).



Use the <Up/Dn> keys to call up further data of the firing automat. The 2nd display page lists information about the disturbance history (type and volume of information depending on firing automat).


Number of burner starts at a total resp. since reset of firing automat
Error history
Number of startups total 677
Service counter actual 142
No error
No flame at the end of safty time 004 9:23 min 0.0 µA 227 V
Flame signal during straylight check 001 12 sec 2.2 µA 225 V
Total : 46
Straylight : 22
Safty time : 9
Loss of flame : 17
FT/LW : 0
Current error
Last 2 errors (Satronic)
Last 5 errors (Siemens)
Error statistics (errors number)

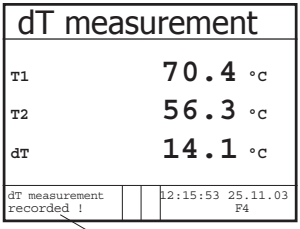
The 3rd display page lists information about the monitoring times (type and volume of information depending on firing automat).


Timing values
Safty time 4.9 sec
Delay time valve 2 40 sec
Pre-ignition time 17 sec
Post-ignition time 20 sec
Delay straylight sup. 11.5 sec
Straylight supervision 5 sec
Rest time TSA 4.1 sec
Further pages: <↑ ↓ >
Monitoring times of firing automat

13.2. dT measurement

With the ecom-J2KN a difference temperature measurement is possible. For measurements at pipings (e.g. in and out of heating systems) special temperature sensors are needed, that can be ordered from your responsible rbr distributor. Select from the main menue point **"Diagnostics"** the submenu **"dT measurement"** and confirm with **<OK>**.

The instrument indicates the temperature T1 (sensor at connection „gas temperature“), the temperature T2 (sensor at connection „air temperature“) and the difference of both temperatures (T1 - T2). With the key **<Memory>** the result of the measurement are stored in intermediate memory. A printout can be started with **<Print>**.



Measurement stored in intermediate memory

13.3. Heating Check (Option)

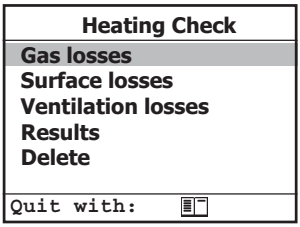
The heating check is a simple, expressive process to evaluate a complete heating plant (heat production, distribution and transfer) from the energetic point of view.

Hereby the single plant components get inspected by the heating engineer in a combination of measurements and visual assessment and valued in regards of their energetic quality acc. to a negative point system of maximum 100 points.

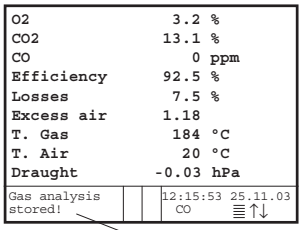
The higher the score, the farer the current plant is away from the desirable energetic stand and the higher the energy saving potential would be if modernisation measures are conducted.

In combination with the special probes required hereto, the ecom-J2KN is able to perform the measurement of the heating check parameters: gas losses, ventilation losses and surface losses.

Out of the main menu point **"Diagnostics"**, select the sub-menu **"Heating Check"** and confirm with **<OK>**.



The **gas losses measurement** is to be performed with the instrument´s sampling probe in the gas core stream after menu call up (see chapter 8.1.). Once the measurement is recorded with **<Memory>** (disk symbol) the conversion of the measurement results in negative points is available under the menu point **„Results“**.

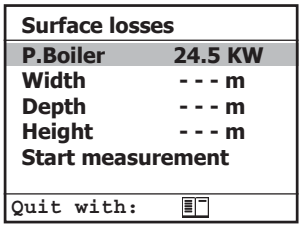


Measurement stored in intermediate memory

The **surface losses** measurement is performed by a temperature sensor specific for surfaces. The temperature difference between boiler surface (temperature sensor at connection „gas temperature“) and room temperature (air temperature sensor) is determined and the percentual loss is calculated. Once the menu point is called up, the boiler performance must be inputed. To easy the measurement width, depth and height of the boiler can also be entered (dimensions will be memorized for surface calculation). Please proceed as follows:

Temperature sensor for surfaces

- activate respective input window with **<OK>**
- inputs values using the keys numerical function
- confirm input with **<OK>**



The dimensions can be entered also later for each surface.

Press **„Start measurement“ / <OK>** to start the real measurement. Proceed as follows:

- select surface (boiler side) to be measured with **<F1>** or **<F2>**
- position surface sensor
- record temperature difference with **<Memory>** - up to 10 values can be recorded per surface out of which a mean value will be calculated automatically
- if need be, cancel measurements with **<F4>**
- repeat this procedure for each surface

Surface losses

```
Width          ---  m
Height         ---  m
          Surf ---  m2
          T.S. ---  °C
          T.A. ---  °C
          T.S. 21.5 °C
          T.A. 21.5 °C
```

-0-

Surface losses

```
Width          1.20 m
Height         1.20 m
          Surf 1.44 m2
          T.S. 40.5 °C
          T.A. 21.5 °C
          T.S. 42.5 °C
          T.A. 21.5 °C
```

-1-

Once all surface temperatures have been determined, quit the menu with <**ESC**>. The surface losses get automatically calculated. The value conversion in negative points is available in the menu point **„Results“**.

The **ventilation loss** measurement is performed by a flow probe 30 sec. after burner switch-off. This measurement can be performed at the earliest 5 min. after instrument´s switch-on as the pressure sensor requires this period of time for stabilisation. Once the menu is called up, the values for air pressure, external temperature, boiler performance and exhaust gas pipe diameter must be inputed . Hereto proceed as follows:

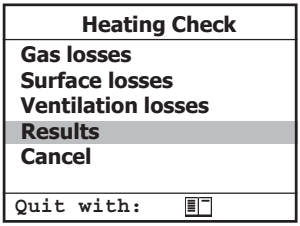
- open respective window with **<OK>**
- input figures using numerical function of keys
- confirm input with **<OK>**

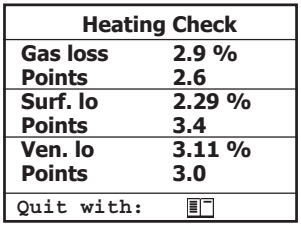
Flow probe

Press **„Start measurement“ / <OK>** prior to going thru the following steps to start the measurement:

- release tubing of the flow probe
- wait for zeroing of pressure sensor
- re-connect tubing of the flow probe
- position flow probe into exhaust gas pipe
  (observe mark for flow direction)
- switch off burner and simultaneously press **<F1>**
  or:
- press **<F2>** to activate timer (5 sec.) and switch off burner by beep
- after approx. 30 sec. the measurement value converted in negative points is available

An overview of the measurements is available under **„Results“**. Press **<Print>** to print them out.





14. Maintenance tips

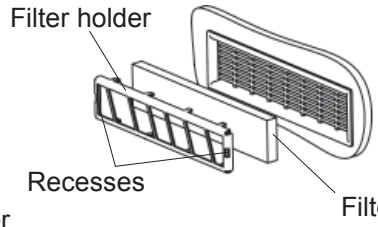
Do not use other sensors or feelers from other manufacturers otherwise the TÜV approval will not be valid anymore!

We recommend to send your instrument for maintenance one time a year, however after max. 250 operation hours, to the next authorised service centre and let the sensors checked and the internal tubing cleaned. The following advices will be of help for the daily check and maintenance of single parts or assemblies:

Service made by service centres not authorised by rbr-Computertechnik GmbH will result in a complete and immediate lost of any warranty!

Fine dust filter (condensate trap/gas cooler)
Screw off the cover of the condensate trap/gas cooler and check the state of the particle filter. Change it once the filter has a grey colour (number 2-3 of the soot comparison scale).

Ventilation filter
The ventilation filter should be changed, if the filter is grey colored (number 2-3 of the soot comparison scale). Remove for this the filter holder with the help of a screw driver (recesses on the right of and left side). Change the filter cartridge and fasten the filter holder.



Sensors
The sensors get calibrated with the reference gas fresh air by each switch-on procedure. The state of the sensors is permanently controlled by the instrument. New sensors age along the operation period because of the wearing of the reagents (oxygen sensor) and due to soiling respectively exceeding concentrations beyond the nominal measurement range (toxic sensors).
The output values of the sensors are (enter menu **"Control"**):

O2	approx. 18000 mV
Others	0 mV (+/- 150)

If an error message is displayed during calibration and cannot be eliminated despite several calibration phases, so the instrument must be checked by a qualified and authorised service centre. The oxygen sensor must show a value >7000 mV, otherwise it must be changed by an authorised service centre.
The CO sensor is protected against exceedings by the internal programme. If the limit value of 4000 ppm is exceeded, a second pump switches on and flows the sensor with fresh air.

SO2/NOx filter
In the tubing leading to the CO sensor on the top of the instrument there is a chemical filter for filtering SO2 and NOx out of the flue gas. The filter material is manganese-4-oxide granules and should be changed once it has turned grey (colour change: pink> brown> black> grey> white).

Probe and hose
Depending on the frequency of use, probe and hose should be regularly cleaned in order to release particle deposits and to prevent early wearing due to corrosion.

-Release the connections at the instrument and at the probe grip to free the hose.
-Clean the hose (flow warm water in then dry respectively blow water drops out).

Change printer paper roll

-Release the printer cover.
-If necessary, extract the paper rest out of the printer (**"Adjustments"/"Paper feed"/<OK>**).
-Remove the printer shaft and place the new paper roll on the printer shaft.
-Insert the paper end in the slot (future printed side must be ahead).
-Press (**"Adjustments"/"Paper feed"/<OK>**) to transport ± 10 cm paper thru the printer.
-Place the printer shaft back in the fixation.
-Insert the paper thru the cover of the printer compartment.
-Close the printer compartment while fixing the cover.

15. Technical Data

Parameter	Range	Principle
O_2	0 ... 21 vol-%	Electrochemistry
CO	0 ... 4000 ppm	Electrochemistry
CO% (Option)	4000 ... 63000 ppm	Electrochemistry
NO (Option)	0 ... 5000 ppm	Electrochemistry
NO_2 (Option)	0 ... 1000 ppm	Electrochemistry
SO_2 (Option)	0 ... 5000 ppm	Electrochemistry
H_2S (Option)	0 ... 500 ppm	Electrochemistry
H_2 (Option)	0 ... 2000 ppm	Electrochemistry
HCL (Option)	0 ... 100 ppm	Electrochemistry
C_xH_Y (Option)	0 ... 4 vol-% (CH_4)	Catalytic
C_xH_Y (Option)	0 ... 2000 ppm (C_3H_8)	Infrared
C_xH_Y (Option)	0 ... 30000 ppm (CH_4)	Infrared
CO% (Option)	0 ... 63000 ppm	Infrared
CO_2 (Option)	0 ... 20 vol-%	Infrared
Air pressure	300 ... 1100 hPa	DMS bridge
CO_2	0 ... CO_{2max}	Calculation
T-G	0 ... 500 °C	NiCr/Ni
T-Air	0 ... 99 °C	Semi-conductor
Differential pressure	0 ... +/- 100 hPa	DMS bridge
Efficiency	0 ... 120 %	Calculation
Losses	0 ... 99,9 %	Calculation
Excess air	1 ... ∞	Calculation
CO undiluted (adjustable ref. O_2)		Calculation
Flue gas dew point		Calculation

Power supply	Mains power 230 V / 50 Hz~; accu 6 V / 7,2 Ah
Protocole printer	integral; 58mm paper width; printout end individually labellable
Indication	graphic display; backlit
Dimensions (LxHxD)	500 mm x 300 mm x 260 mm
Weight	approx. 11 kg with standard sampling probe

Description of data record ecom-J2KN with Multi Media Card
Format data logger recordings: J2KDL-xx.csv (separation mark between values = comma)
Format punctual measurements: J2KDV.txt (separation mark between values = comma)

Column	Description	Remark/Example
A	Datum	DD.MM.YYYY (also by US version)
B	Time	HH:MM:SS (also by US version)
C	O2 in vol.%	0,0 - 21,0
D	CO in ppm	0 - 4000
E	NO in ppm	0 - 4000
F	NO2 in ppm	0 - 200
G	SO2 in ppm	0 - 2000
H	CO converted	*
I	NO converted	*
J	NO2 converted	*
K	NOX converted	*
L	SO2 converted	*
M	T.Gas in °C or °F	0 - 500 (US version with other range in °F)
N	T.Air in °C or °F	0 - 99 (US version with other range in °F)
O	Draught in hPa	0,00 - 20,00
P	CO2 in vol.%	0,0 - 25,0
Q	Eff. in %	0,0 - 100,0
R	Losses in %	0,0 - 100,0
S	Excess air	> 1,00
T	Dew point in °C or °F	0 - 500 (US version with other range in °F)
U	Poisoning index	> 0,0
V	O2 (gas channel check) in vol.%	0,0 - 21,0
W	CO (gas channel check) in ppm	related to 0,0 vol.% O2
X	CO (gas channel check) in ppm	Measured value
Y	O2 (check if O2 mixed) in vol.%	0,0 - 21,0
Z	T. Boiler	0 - 999
AA	T. Sensor	0 - 99
AB	O2 ref.	0,0 - 21,0
AC	Unit	0=ppm; 1=mg/m3; 2=mg/kWh; 3=mg/MJ
AD	Norm	N= converted to O2 ref.
AE	Fuel type number	Index acc. to instrument table
AF	Fuel type text	Text acc. to instrument table
AG	Soot1	0,0 - 9,9
AH	Soot2	0,0 - 9,9
AI	Soot3	0,0 - 9,9
AJ	Oil trace	0=no; 1=yes;
AK	20 characters text	
AL	20 characters text	
AM	16 characters text	
AN	Serial number	
AO	CO (check if O2 mixed) in ppm	
AP	Draught (check if O2 mixed) in hPa	
AQ	CxHy	
AR	Number copy data	
AS	T1 (deltaT-measurement)	
AT	T2 (deltaT-measurement)	
AU	velocity	m/s
AV-AW	Comma	Reserve field
AX	Comment text	
AY	Comment text	
AZ	Comment text	
BA	Comment text	
BB	H2 in ppm (only IB-Version)	CH-Version = Oil consumption
BC	H2 converted*	CH-Version = Firing thermal output
BD	Sensor 6 in ppm (only IB-Version)	CH-Version = Operation hours counter
BE	Sensor 6 converted*	CH-Version = Code
BF	dP (velocity) in Pa	0,5 Pa
BG	Air pressure	300 - 1100 hPa
BH	Last column	0
	CR-LF	#13#10

* converted on unit (column AC) and converted on O2 ref. (column AB) when column AD = N

Data transfer ecom-J2KN to PC (USB)
The transfer occurs with 1200 - 38400 BAUD; 1 stop bit; no parity (ANSI character set)
CR / LF is sent after each data record.

Column	Description	Length	Example (unit)
1-5	Storage number	5	1
6-7	Hour	2	9
8-9	Minute	2	7
10-11	Day	2	4
12-13	Month	2	3
14	Fuel type (*)	1	0
15-19	Room temperature	5	21 (°C)
20-24	Gas temperature	5	484 (°C)
25-29	Oxygen (BImSchV)	5	209 (%; without comma)
30-34	CO (BImSchV)	5	889 (ppm)
35	Draught	1	- = minus; blank character = plus
36-39	Draught	4	value in Pascal
40	Oil trace	1	0 = no; 1 = yes
41	Soot dot 3	1	1
42	Soot dot 2	1	1
43	Soot dot 1	1	1
44-48	Free	5	
49-53	NO (BImSchV)	5	45 (ppm)
54-58	Boiler temperature	5	55 (°C)
59-78	20 characters text (1st display line)	20	e.g.: Name
79-98	20 characters text (2nd display line)	20	e.g.: Street
99-114	16 characters text (3rd display line)	16	e.g.: ZIP/City
115-116	2 special signs (HEX $80, $00)	2	
117-121	Oxygen (CO measurement)	5	209 (%, without comma)
122-126	CO (CO measurement)	5	540 (ppm)
127-131	Free	5	
132-136	Free	5	
137-141	Free	5	
142-146	Free	5	
147-151	Free	5	
152-156	Oxygen check	5	209 (%, without comma)
157-161	CO (Oxygen check)	5	45 (ppm)
162	Draught (sign)	1	- = minus; blank character = plus
163-166	Draught (Oxygen check)	4	value in Pascal
167-168	CR-LF	2	#13#10

Date transfer PC to ecom-J2KN (ANSI charecter set)

First send:	$00 $01
Then send:	56 characters text
Then send:	$80 $00

Once the ecom-J2K has processed the data, it sends $FF back. If the data volume is too large, it sends an other Byte back. If the data transfer should be terminated, so just 60 Byte $00 need to be sent to the instrument.

Subject to technical changes
V3.0 / 05.2010
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